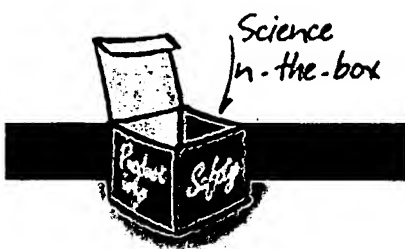


# EXHIBIT 8

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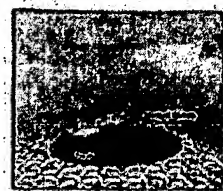


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## Chemical Functional Definitions

### Bleach Systems

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- ▶ [Bleaches that are used in cleaning products and how they work.](#)



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Larger stain molecules are broken down into smaller, more water-soluble fragments, which are more easily removed by mechanical action or through the action of other detergent ingredients.



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The bleach reacted with the stain to remove the conjugated double bond system. The colour is gone. This stain becomes invisible.

### Why use bleach in cleaning products?

Bleach helps the cleaning process by removing and / or decolorizing stains (i.e. whiten or lighten colors). The key mechanism is a chemical reaction that "cuts" the stain molecules in smaller pieces that are more easily removed. Bleach can also act by removing their color so that the stains become invisible. These processes may all work simultaneously on any given organic stain.

Bleach is not only effective on stains but also allows achieving whiteness and dingy cleaning. Dinginess is the overall greyish appearance that white fabrics sometimes develop over time and after many wash cycles.

The first mechanism of bleach action is quite similar to what enzymes do: the larger stain molecules are broken down into smaller, more water-soluble fragments, which are more easily removed by mechanical action or through the action of other detergent ingredients. Unlike enzymes, however, the action mechanism of bleach is a self-destructive one: the bleaching agents disappear in the course of the wash cycle.

The action of bleach complements that of the surfactants and enzymes in the wash. Some soils that surfactants and enzymes may leave behind, or may only partially remove, are removed by bleach. Also, the fragmenting action of bleach makes the job of surfactants and enzymes during the wash easier.

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### What is bleach?

Bleach is an active molecule that can chemically react with different type of substrates. There are many different kinds of bleaches. When the substrate is a stain, the action of bleach is desirable. When the substrate is a dye in a fabric, the action is not desirable. Chemically speaking, the mechanism of bleaching may be oxidative or reductive; in laundry and cleaning products, oxidative bleaches are used.

Oxydative beaches are compounds that release hydrogen peroxide ( $H_2O_2$ ) or singlet oxygen during the wash, or they may be peroxides of organic acids also known as peracids themselves.

Hypochlorite, peroxides, peracids, singlet oxygen are very reactive chemical species; they react with certain parts of organic matter that are responsible for its color. As a result, the organic matter becomes colorless.

hypochlorite/peroxide/peracid/singlet oxygen are used up in the process.

Some of the reactions between bleach and organic matter result in the actual breakage of bonds in the organic matter, thereby releasing smaller molecules of organic matter that are more water soluble.

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Bleach systems that can be used in cleaning products and how they work. Hypochlorite, hydrogen peroxide ( $H_2O_2$ ), singlet oxygen and peracid are the actual, oxidative and so-called bleach actives. They act directly on the stains. The different types of bleaching system have different stain removal/ fabric/color care profile. Formulators choose them based on the benefits they want to achieve.

Several classes of bleaches are known to improve the laundry process:

1. Sodium hypochlorite ( $NaClO$ ) releases highly reactive hypochlorite ions ( $ClO^-$ ) under alkaline conditions. This is the standard of excellence for stain removal but cannot be used on colored garments. Effective at low temperature and excellent at germ kill. Sodium hypochlorite are not part of a detergent formula but separate product added during the wash process or used directly or after dilution on hard surfaces.

2. Hydrogen peroxide ( $H_2O_2$ ) is one of the most common bleaching agents. The positive aspects of hydrogen peroxide include the fact that it is environmentally friendly (decomposes to  $O_2$  and  $H_2O$ ), colourless and non-corrosive. To be effective however, hydrogen peroxide requires alkaline conditions and suitably elevated temperatures of about  $50^\circ C$ . Hydrogen peroxide (liquid form) can be used as such in commercial products (i.e. ACE Gentile line up for P&G) or associated with compounds such as borates or carbonates to form solid particles, providing opportunity to formulate hydrogen peroxide in granular detergents.

Sodium perborate is one of the most widely used solid peroxygen compounds. However in the last 10 years, mainly as a result of environmental pressures - to reduce boron content of detergents- sodium perborate has slowly been replaced by sodium percarbonate. Sodium percarbonate has a greater rate of dissolution, a more environmentally friendly profile (no release of Boron).

Perborate and Percarbonate are usually used in combination with a bleach activator (TAED or Tetra Acetyl Ethylene Diamine) to increase bleaching efficiency at low temperature thanks to the formation of peracetic acid by the reaction of TAED with hydrogen peroxide from percarbonate. In this case, the peracetic acid is the actual bleaching ingredient.

3. Peracids work similarly to  $H_2O_2$  but they are more effective than  $H_2O_2$  at low temperatures (below  $40^\circ C$ ). Some peracids can be pre-formed and added to the detergent product. However, many peracids are not sufficiently stable to be added to a detergent product. They can be formed during the wash process in presence of hydrogen peroxide and a bleach activator.

4. Bleach activators come to the rescue! They are peracid precursors. During the wash, the reaction between  $H_2O_2$  and bleach activators produces peracids; the latter are the actual bleaching agents. A common bleach activator is TAED (Tetra Acetyl Ethylene Diamine). The "-OBS" activators are hydrophobic esters of Oxy Benzene Sulfonate. They work well on dingy cleaning and food stains.

5. Catalysts work by making hydrogen peroxide or singlet oxygen more

effective when reacting on stains. They are complex organic molecules with a metallic center. The catalysts are not consumed during the wash process i.e., very small amount can make all the hydrogen peroxide present in the wash process more effective.

6. Photobleaches are also catalysts but they don't work during the wash; instead, they work on the laundry that is hanging on the line outside to dry. Sunlight triggers the formation of singlet oxygen from the air. Singlet oxygen is the actual bleach active.

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